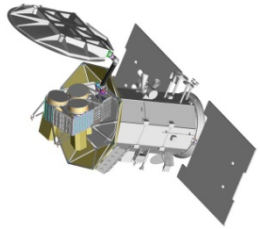
Aquarius/SAC-D Mission Update - G. Lagerloef SPURS Workshop 22-24 Feb 2011

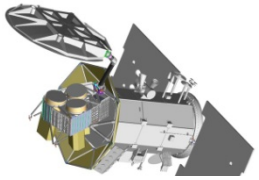
Outline



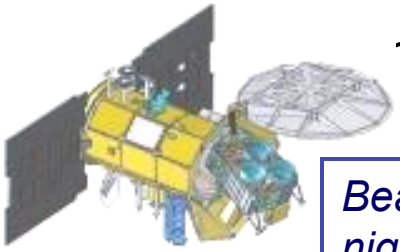
- Overview, orbit, SPURS sampling
- Project schedule
  - MIMU, ACE, Thruster status
  - LRD status 9 June
    - Decision milestones
    - Launch site activities
- Simulator status
  - Browser
  - Data access
  - Documentation

- Data Policy
  - PO.DAAC main portal for all science data and documentation
  - Still setting up interface with GSFC processing system

Mission Design and Sampling Strategy



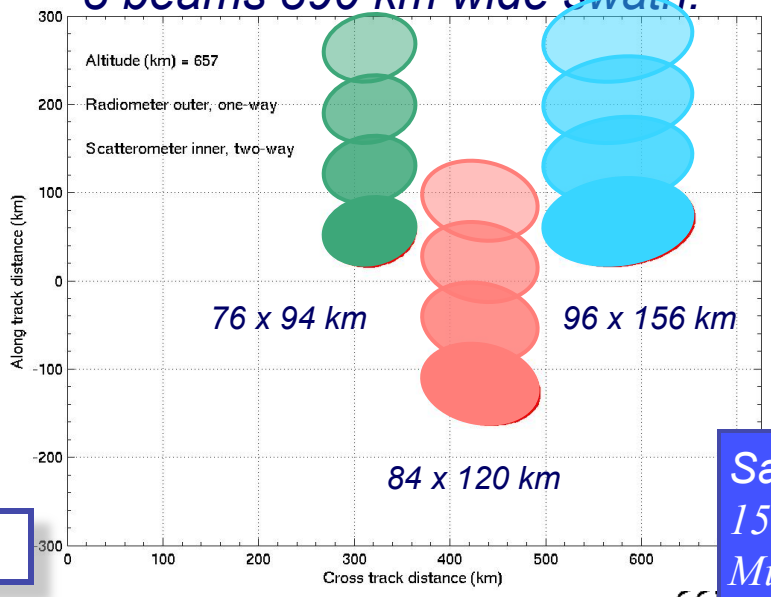
Sun-synchronous exact repeat orbit
6pm ascending node
Altitude 657 km

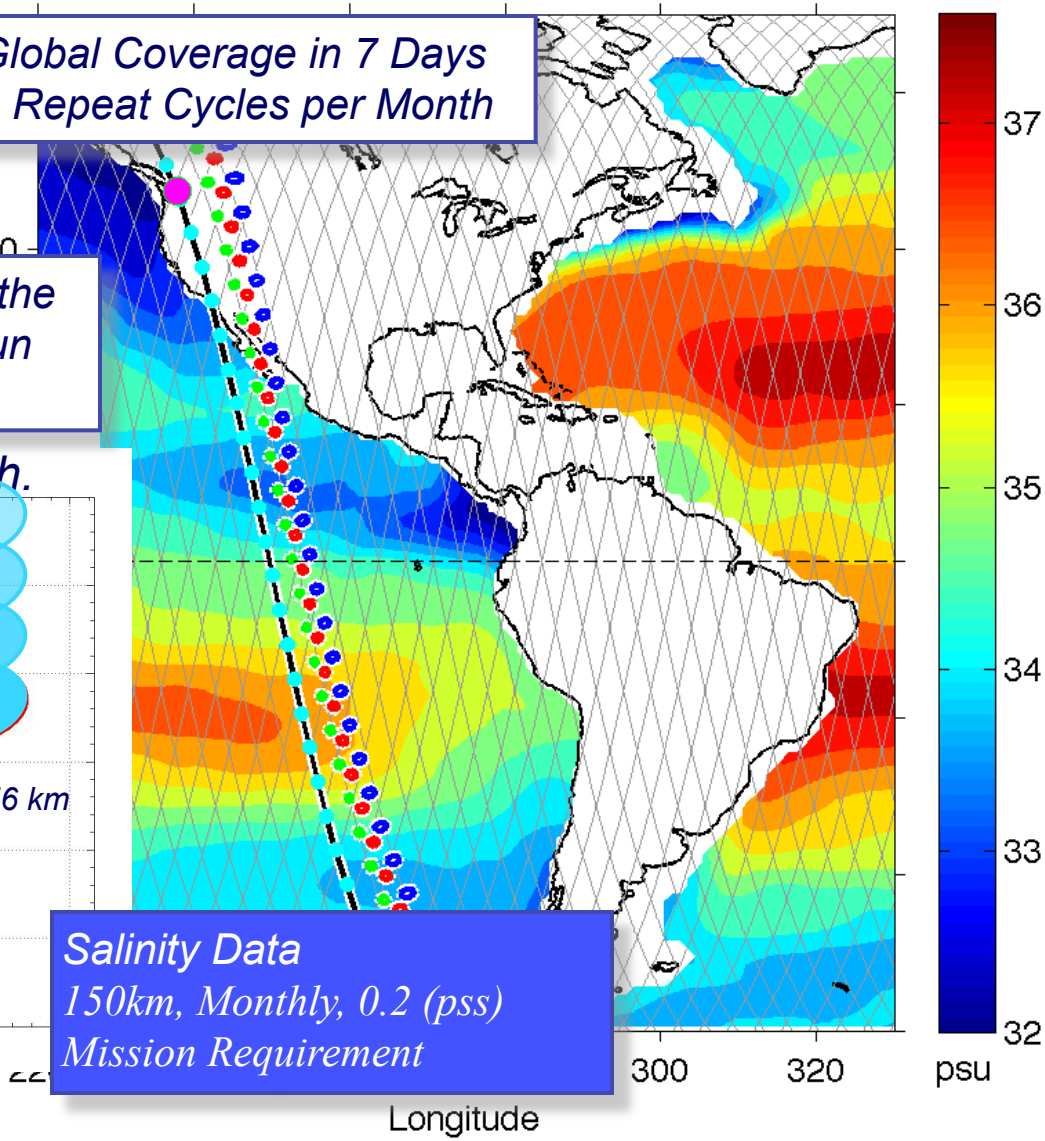


- *Global Coverage in 7 Days*
- *4 Repeat Cycles per Month*

Beams point toward the night side to avoid sun glint

3 beams 390 km wide swath.



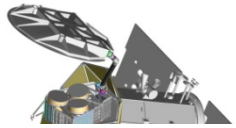


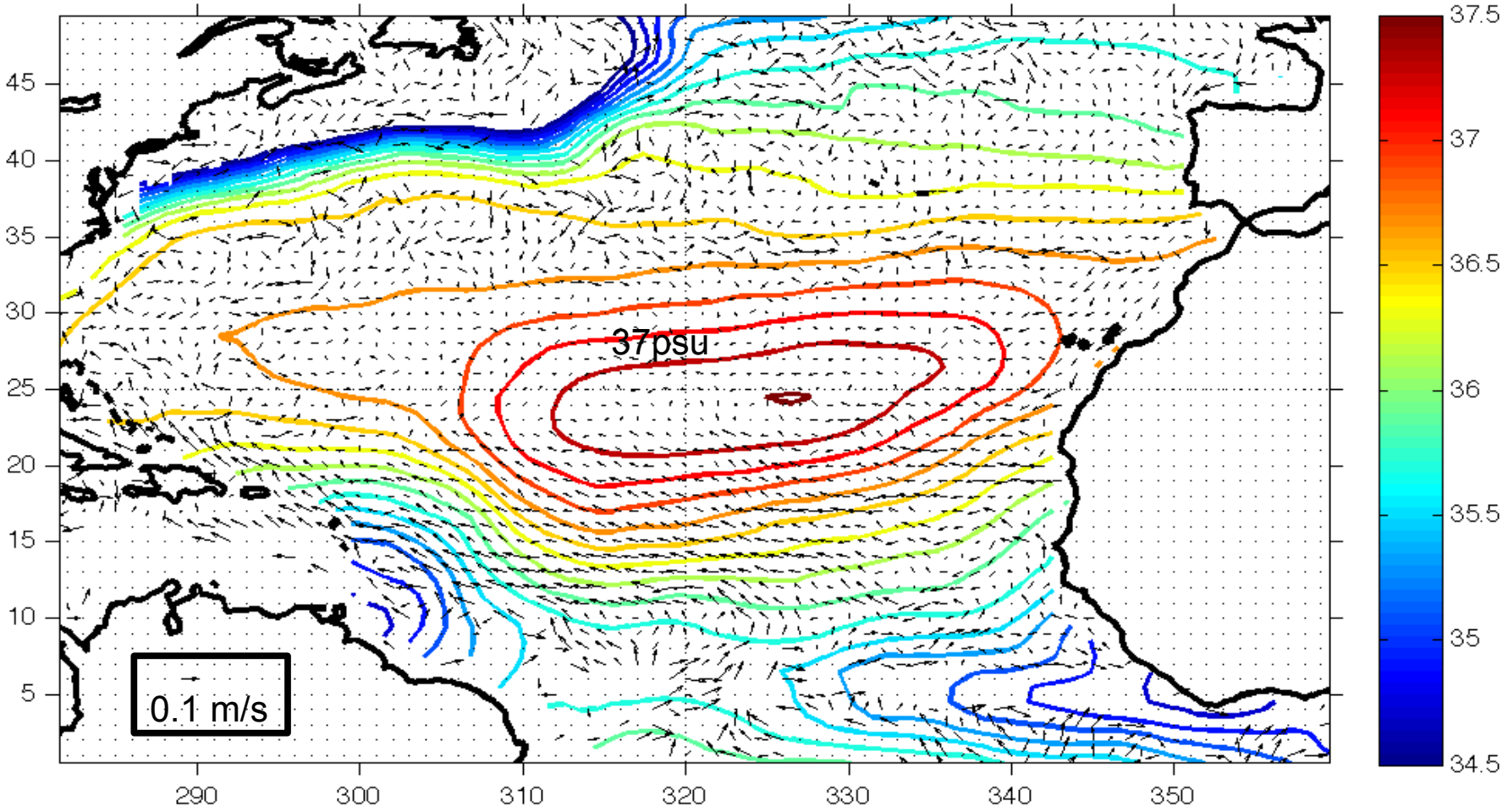
In Orbit Check out

Launch

Salinity Data
150km, Monthly, 0.2 (pss)
Mission Requirement

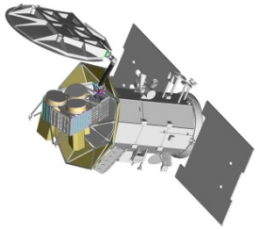
North Atlantic Salinity Maximum Salt Balance

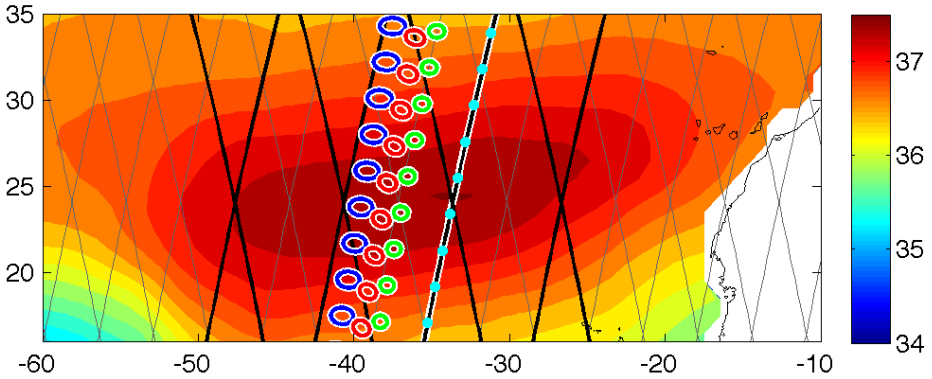




$$h\frac{\partial\langle S\rangle}{\partial t} = -h\langle\vec{u}\rangle\bullet\nabla\langle S\rangle - \nabla\bullet\int_{-h}^{0}\hat{\vec{u}}\hat{S}dz - (\langle S\rangle - S_{-h})\left(\frac{\partial h}{\partial t} + \vec{u}_{-h}\bullet\nabla h + w_{-h}\right) + (E-P)S_0 + SSM$$

Orbit sampling in SPURS study area





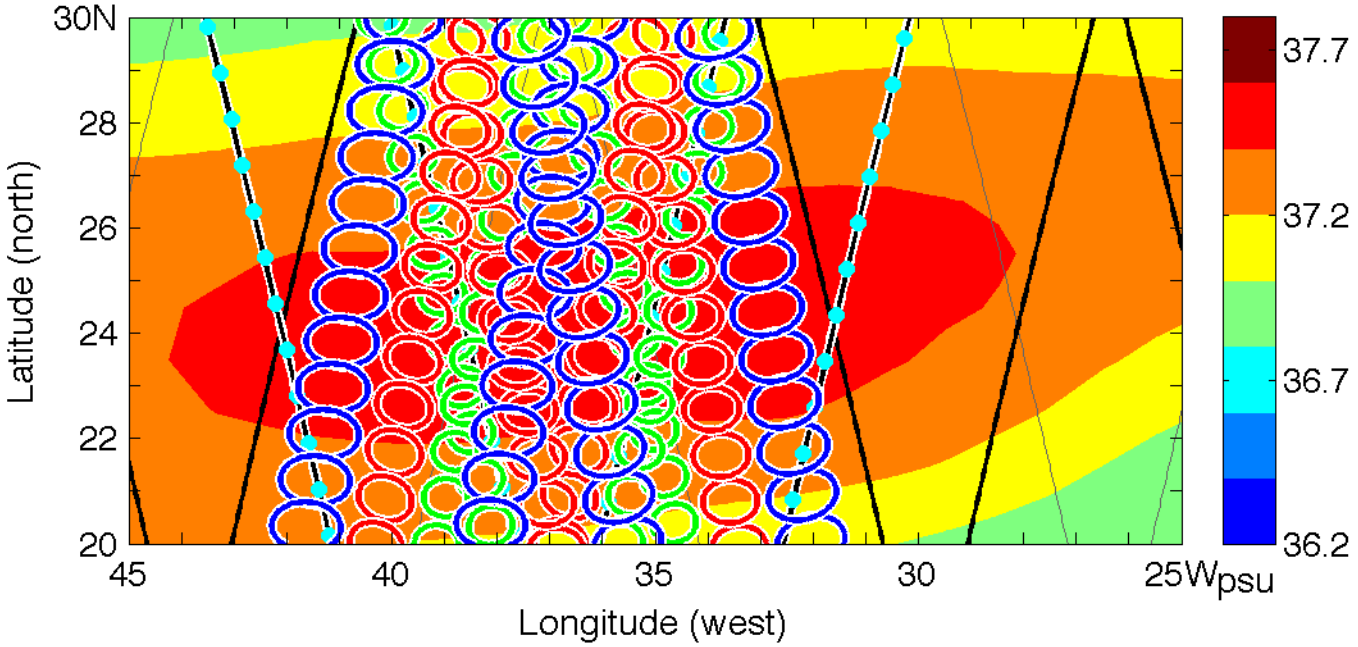
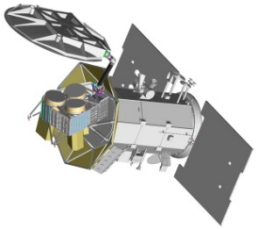
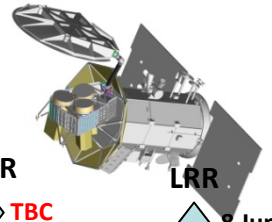


Photo Gallery



Laboratory for Integration and Test (LIT), Sao Jose dos Campos, Brazil

Summary Schedule



delta-MOR 8-9 Nov

PSR-VAFB 2-3 Mar

ORR 26-27 Apr TBC

LRR 8 Jun

2010 | 2011

Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun

INPE/LIT, Brazil
ATLO-3

VAFB, USA
ATLO-4

26Jun

5Jul

EMI/EMC

Dynamics/Acoustic/Shock

TB/TV

ACE CPU Board Manufacture & test @ BRC

Mission Level Tests

ATLO-3 Slack

Lagrange SW upgrade

Environmental Test Campaign

26 - 28Mar

ATLO-4 Slack

ULA Activities

Transportation to INPE/LIT

DTM re-installation and Verification

MIMU Replacement & test @ SJC

Ops @ SSI

5 May

19Mar

Thruster Interfaces Design & Manufacture

Thrusters Replacement

Preparation & Transportation to VAFB

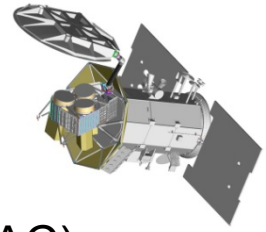
Hand-over To ULA (18 May)

Launch (9 Jun)

Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun

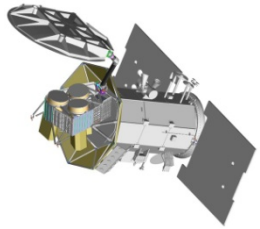
2010 | 2011

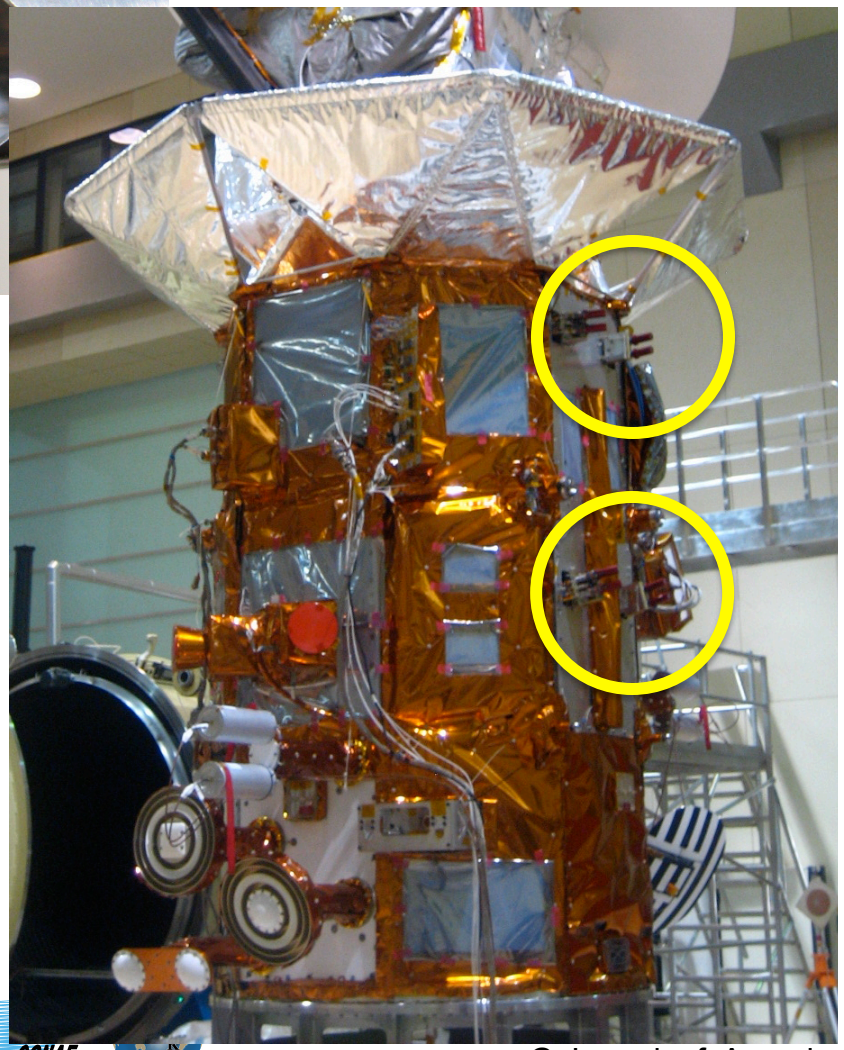
Status of Observatory



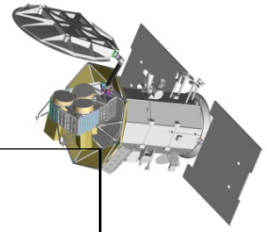
- Completed EMI/EMC, Dynamic, Acoustic , and Thermal Vacuum (TVAC) testing, final alignment, post-TV CPT and cleaning
- Three significant SAC-D problems were encountered in Dec 2010
  - **Thrusters**: During qualification testing the catalyst bed chamber ruptured at about 6200 pulses [Baseline plan is to replace all thrusters]
  - **ACE (Attitude Control Electronics)**: During the last cold plateau (at -15°C), the A side of the ACE failed to boot. Repeated attempt to boot at temperature below +5°C also failed. All boot attempts above +5°C were successful. [Baseline plan is to fly as is, continue to exercise the ACE and build a spare board and replace if required]
  - **MIMU (Miniature Inertial Measurement Unit)**: Temperature telemetry from one of the two MIMU units exhibited noisy output values (persistent during hot and cold temperatures). [Baseline plan is to replace the MIMU with a qualified unit from the same vendor; completing paperwork for MIMU export from Argentina to Brazil]
- NASA/CONAE/INVAP have worked together to investigate and develop resolution plans for all 3 SAC-D problems while meeting the June 2011 LRD

Propulsion Thruster Replacement





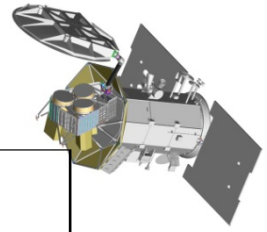
Pending Activities through arrival to VAFB – 1 of 2



FEBRUARY 2011

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4	5
	Mission tests technical review			MVT - GSE Setup - Commands Upload & others		
	Solar Panel +X Thermal Cycling					
6	7	8	9	10	11	12
	Lagrange Software upgrade Testing @ Córdoba (EM)					SA ready to ship
Mission Test TRR	SDI-OneDay-DeltaCmds-Aq Mission tests					
13	14	15	16	17	18	19
	Thrusters ready @ JPL	Splinters 8:30 am GOR @ VAFB	GOR @ VAFB			
	Lagrange-ROSA-PAD Verification, Performance, Software upgrades					
20	21	22	23	24	25	26
	S/P MLI Blankets adjustments			LPRR@ VAFB		Aq Reflector Deployment
		CRR #2 @ ULA		Aq Reflector deployment prep.		
	MIMU TRR	MIMU replacement and AOCS Tests				
27	28					
Aq MLI closeout & Reflector stow	Discharge bats Disconnect Move to 10K		Done			
			Pending			

Pending Activities through arrival to VAFB – 2 of 2

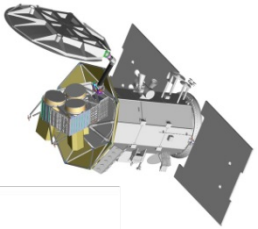


MARCH 2011

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	28	1	2	3	4	5 Carnaval - Br
			Pre-Ship Review @ LIT			
		GOLF disassembly				
				Current thrusters Removal		
6 Carnaval - Br	7 Carnaval - Br	8 Carnaval - Br	9 Carnaval - Br	10	11	12
	GOLF disassembly					
					SMD/ESD DPMC Chairman´s Review	S/C Aliveness Tests
	New DTMs Installation					
13	14	15	16	17	18	19
New DTMs Installation		Propulsion S/S End-to-End Tests	Nozzles Alignment Verification		Obs Preparation for Shipping	Shipping Prepar. 1st Flight
	S/C Aliveness Tests			Obs Cleaning		
		COFR Session 1				
20	21	22	23	24	25	26
Shipping Prepar. 1st Flight		Cargo palletization and Customs Verification				Aircraft Loading
					C-17 (1) Arr SJK	C-17 (1) Dep SJK
27	28	29	30	31		
C-17 (2) Arr SJK	Aircraft Loading					
C-17 (1) Arr VAFB	C-17 (2) Dep SJK	C-17 (1) Arr VAFB				

Transportation Dates are locked-in

Transportation 25-29 March 2011



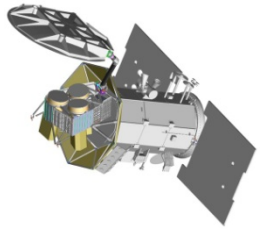
SAC-D Satellite

Approach Shoring

Satellite Container on-load

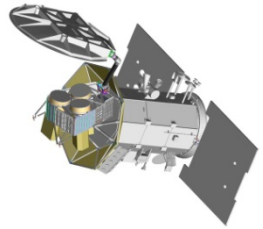
Satellite Container on-load

Launch date contingencies



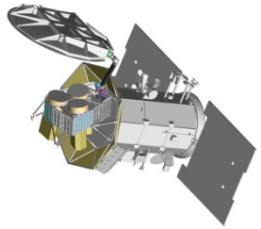
- Baseline plan is 9 June 2011 Launch Date
- Status updates
  - After MIMU replacement this week
  - After Pre-Ship Review next week
  - Completion of thruster re-work mid-March
  - Completion of transportation campaign April 1 (transportation dates cannot slip, any work not complete in Brazil must be made up in VAFB)
- If MIMU, thruster replacement and transportation go as planned, we will be in good shape to make the 9 June launch
- Reasonable probability to delay as late as 13 July without impacting JUNO launch activities.
- If we miss that window, then ???

Launch Site Science Activities



- Science Team meeting (Lite)
  - Keynote science talk
  - Science team posters
- Invitations will be extended to ROSES OSST and SPURS PIs and Co-Is
- JPL guest services will arrange transportation from Buellton, CA to launch viewing area.
- Weather is prone to fog in June-July
- Launch time ~7:05 am PDT (to be confirmed)

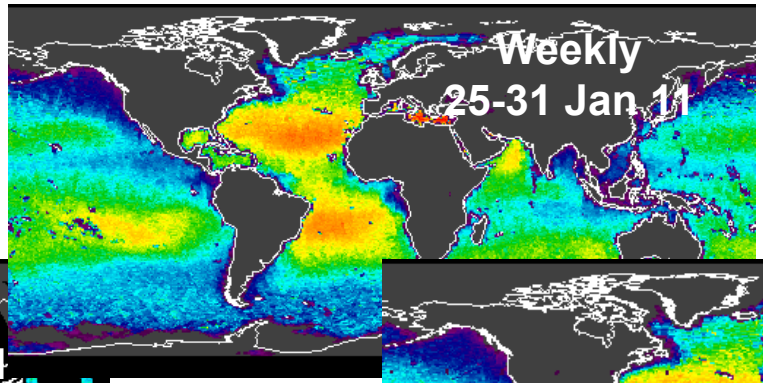
Operational Science Simulator

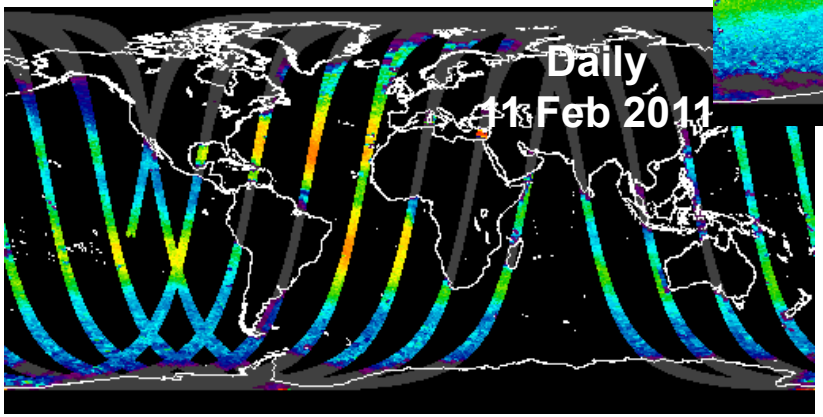


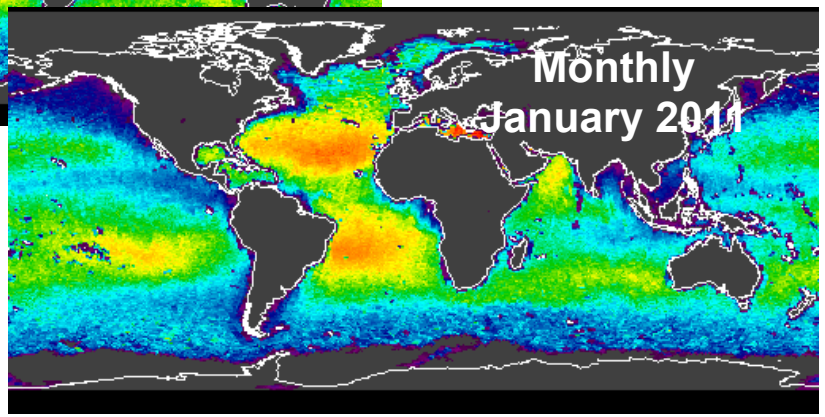
Operational Simulator

- "real time" data processing of simulated data on a daily basis
- Daily data are released through the Aquarius data website as if the mission were actually flying.
- Operational since mid January; files date back to 6 December 2010
- Current latency ~ 10 days; During flight this will be ~ 1 day

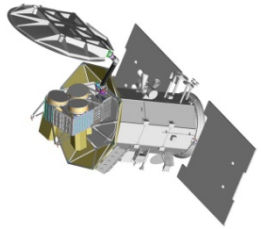
Browse images







Data Access and Policy



- Documentation, and links to access data and browse images
  - http://oceancolor.gsfc.nasa.gov/AQUARIUS/
    - http://oceancolor.gsfc.nasa.gov/AQUARIUS/DOCS/Aquarius_Level-2_Data_Products.pdf
    - http://oceancolor.gsfc.nasa.gov/AQUARIUS/DOCS/Ocean_Level-3_Standard_Mapped_Image_Products.pdf
- PO.DAAC at JPL is assuming primary responsibility for user services (all data distribution, user support, ad-hoc tools etc)
  - PO.DAAC site http://podaac.jpl.nasa.gov/salinity/data.html
  - FTP access now available at this link (Level 2 and 3 simulated data)
    - ftp://podaac.jpl.nasa.gov/pub/salinity/aquarius/simulated/L2/SSS_2/
    - ftp://podaac.jpl.nasa.gov/pub/salinity/aquarius/simulated/L3/SSS_wind_smi/
- Aquarius validation data system: http://aquarius.esr.org/avds/
  - Temporary login: User = avds; password = avds
  - User registry will be installed prior to launch
- **Please: Use the simulated and AVDS data, give us feedback!**
- Mission website at http://aquarius.nasa.gov/

Surface Salinity from Space

A new era begins !

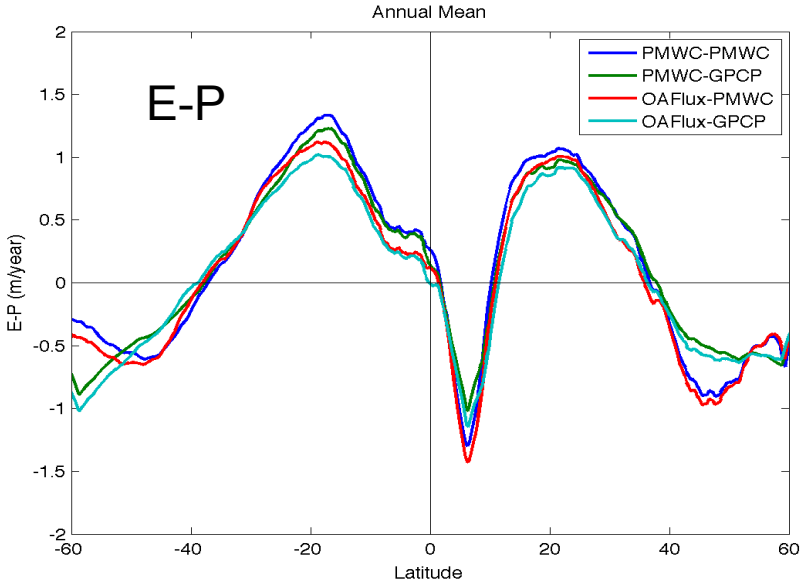
Understanding the Interaction Between Ocean Circulation, the Water Cycle, and Climate by Measuring Ocean Salinity

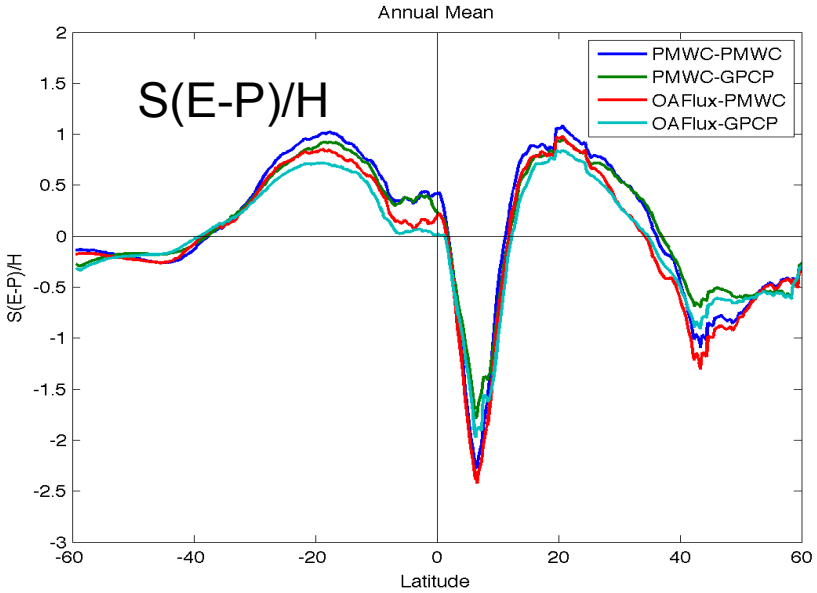
Aquarius/SAC-D

NASA

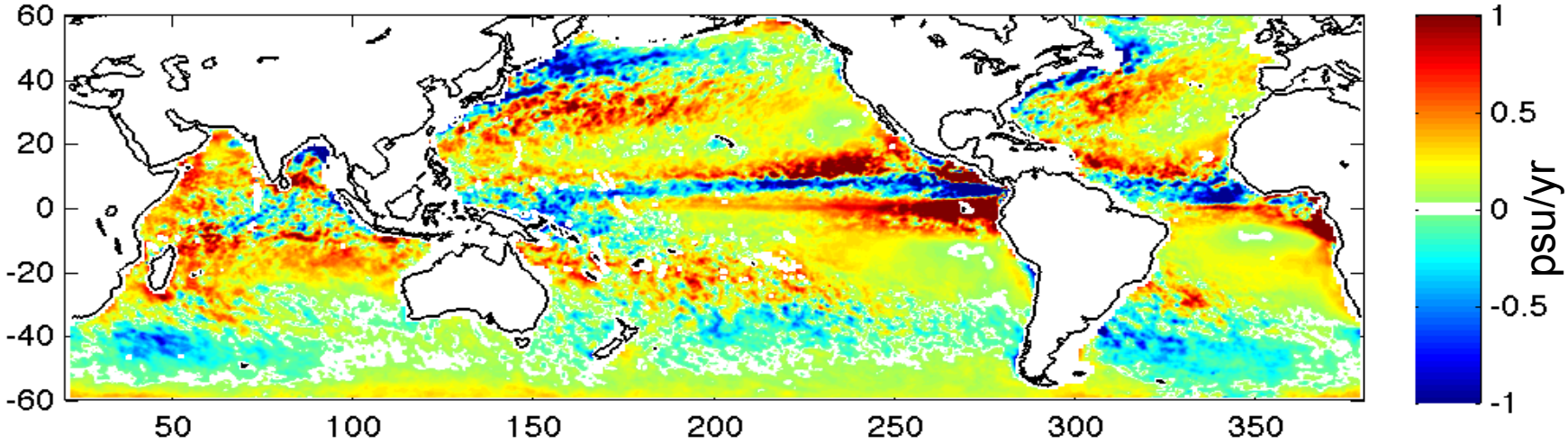
CONAE

Comparing Contemporary Satellite E-P data sets PMWC (E,P), GPCP (P) and OA Flux (E)



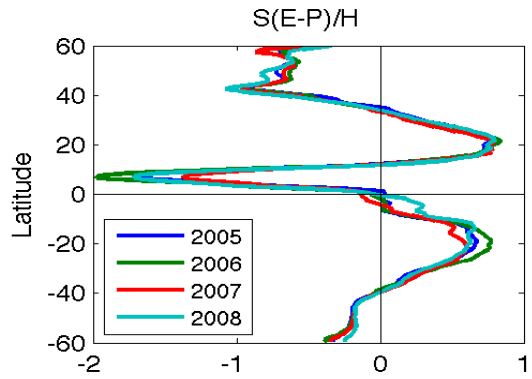


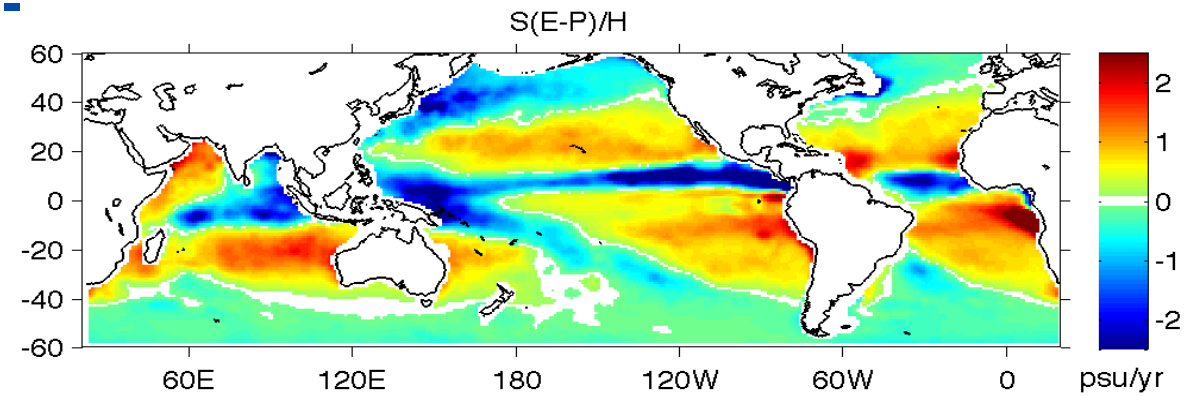
S(E-P)/H difference PMWC vs OAFlux-GPCP

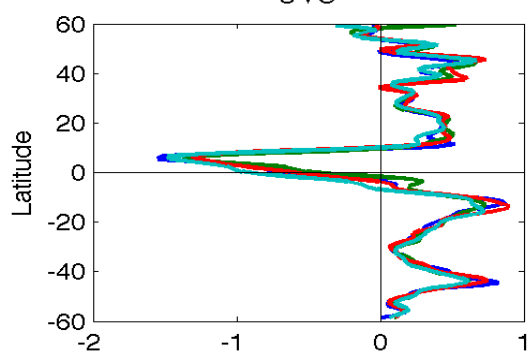


From Lagerloef et al, Oceanography, 2010 in press

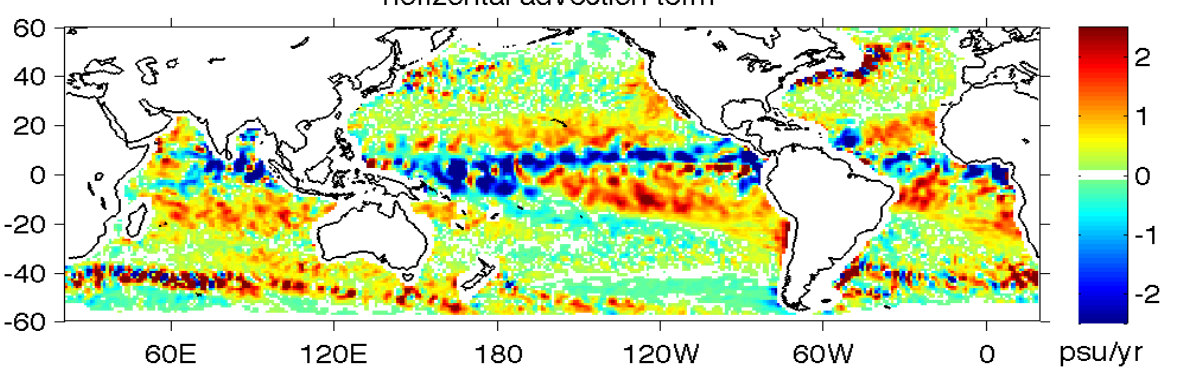
Trial Balance GPCP (P), OA Flux (E) and U•∇S

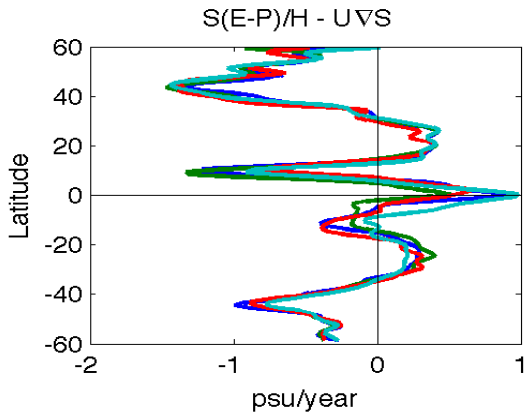


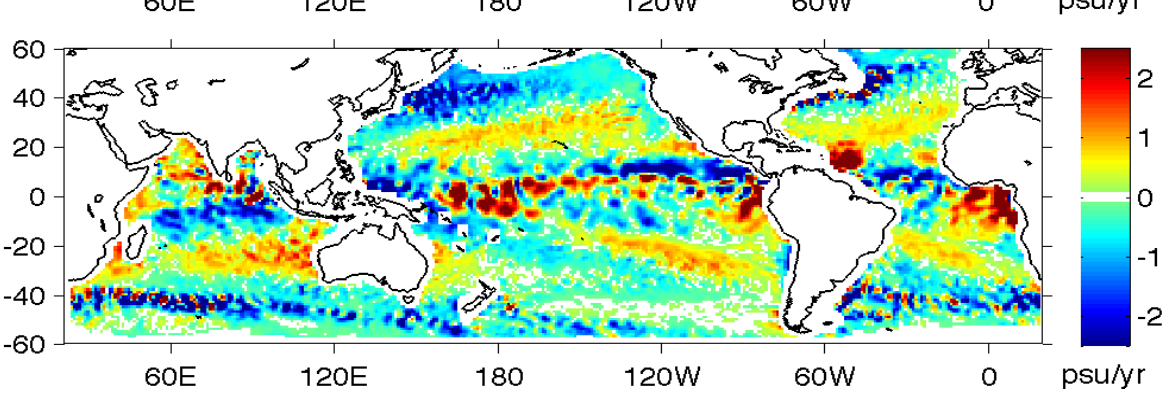




horizontal advection term







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